



Minutes of the 27th
Meeting of the

**Industry Steering
Committee on
Wellbore Survey
Accuracy**

and

**SPE Wellbore
Positioning Technical
Section**

Drumossie Hotel,
Inverness, UK
April 23rd 2008



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** Minutes

1. **BP well positioning health 2007- 08**

Bill Allan of BP provided a brief overview of BP's recent check for internal compliance with their Well Positioning requirements. Non-compliances were identified and categorised.

Bill also mentioned that BP have developed an Engineering Technical Practice document, "Guidance on Practice for Directional Drilling and Surveying" (currently in draft form). The intention is that this document acts as a replacement for the BP Survey Handbook, or at least a supplement to it. Copies are available from Bill on request.



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2. **Depth extrapolation of crustal anomalies**

Tor Inge Waag of Sensorlink described the benefits of using local measurements to identify crustal anomalies and thereby improve the accuracy of magnetic reference field values, but he stressed the importance of downward continuation of the near surface map. The map does not remain constant with depth, unless there are no anomalies.

Although the process of downward continuation requires some guesswork, it can be minimised because only large deep sources are considered, allowing small components to be filtered out and ignored. This also means that older, less precise survey data can be used. This filtering is a key component of Sensorlink's method.

The data set must be large enough to identify large scale effects, but small enough to allow earth curvature effects to be ignored. Tor said that 50 – 100 km square was a suitable compromise.

The effect of downward continuation depends on well depth versus source depth, but can result in increases of between 50 and 100%. Tor therefore recommended the application of downward continuation on all deviated wells drilled in areas with crustal anomalies.



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3. Section constitution

Section Secretary, Harry Wilson referred to the decisions taken at the previous meeting, and the promise of the Section officers to look at how a smooth transition might be made as the new constitution is adopted and new officers are elected.

The officers recommend staggering the election of the Program Chairperson with the other officers. Elections for the three non-officiating members of the board would be held along with the election of the Program Chairperson. To make the transition to the proposed scheme, the officers recommended that the current Section Chairperson should remain in office until October 2009. This will mean that the Program Chairperson elected in October will serve only one year before succeeding to the post of Section Chairperson.

John Thorogood proposed that these recommendations be accepted, and Ed Stockhausen seconded the proposal. There were no objections, and Harry said that he would include the agreed changes in the final version of the amended constitution. (Now posted on the ISCWSA pages at Copesgrove.com)

Dave McRobbie, one of the three non-officiating board members, later indicated that other commitments meant it might be difficult for him to properly discharge his duties. Shola Okewunmi volunteered as Dave's replacement and was accepted by those present.

4. Comparison of continuous gyro error models

Jerry Codling of Halliburton reported that he had compared the outputs for several implementations of bi-axial gyro tools that include mode switch (ISCWSA gyro models SPE 3 and 4). Comparisons were good at higher inclinations, but not good at low inclinations. The disagreement at low inclinations was apparently due to differing misalignment term values.

Angus Jamieson said that these results reinforced the need for a generic set of error term values. Debate followed, but there was no conclusion reached as to how to achieve greater consistency.



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GyroModelCompariso

5. Status report – Collision Avoidance work group

Harry Wilson of INTEQ reported that the Group had met the previous day, and that detailed minutes would be made available on the web site (attached here).

The lexicon and bibliography will be updated after the October meeting, but it is expected that there will be very few changes. A final draft of the Current Common Practices document has been agreed, and will be completed and posted to the web site before the October meeting.



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6. Study of misalignment terms

Anas Sika and Ludovic Macresy of Drillscan reported on their study for Total on the validity of misalignment and sag terms at low inclination. Their study compared the ISCWSA rev 0 model's predictions of misalignment and uncorrected BHA sag uncertainty with the rev 2 model which uses different misalignment terms. Their analysis indicates that the former underestimates uncertainty and the latter overestimates uncertainty. They therefore propose a new SAG term which provides better precision than the existing term.

It was noted that the term value is based on the actual BHA configuration, which is a radical divergence from the current "global" approach to quantification of term values.



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7. Status report - Error Model Management sub-committee

Steve Grindrod of Copegrove Developments reported on the ongoing tasks of the Group.

The effort to provide the WITSML SIG with a standard set of error model term definitions was progressing. A draft list, containing 144 terms, had been agreed and was available on the ISCWSA web site. Steve requested review and comments by the end of June.

The committee's review of the validity of the misalignment terms continued. TOTAL/Drillscan's analysis was helpful, but more work was still needed.

Steve then described some of the problems affecting implementation and use of the ISCWSA models. For example, the azimuth assigned to stations in the vertical interval of a well plan is arbitrary and varies by user; but affects the uncertainty generated by the model. The group will investigate the suggestion of replacing TF dependent terms with independent terms. Bias terms and depth terms are also to be subject to review.

Pete Clark asked if it was possible to remove the azimuth dependency of the misalignment terms at vertical. One solution might be to rely entirely on random misalignment terms.

Harry Wilson suggested that the committee's investigation of reported problems should ignore incorrect implementations, and focus on errors or weaknesses in the model.



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8. Case study of new technique for drilling SAGD wells

Graham McElhinney of Pathfinder described a passive magnetic ranging technique that was used recently on a steam assisted gravity drainage parallel well project. It was used instead of the more standard active ranging technique, which requires intervention in the offset well. The new technique relies on magnetisation of the offset casing string before the casing is run in hole.



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SAGD.CS.pdf

9. Combined In-Field Reference/Multi-Station Correction accuracy study

Roger Ekseth of Gyrodata noted that there is widespread use of MWD with crustal anomaly correction and multistation correction (MSC), but that when gyro surveys are overlapped with such data, the resulting comparison does not support the predictions of the error models being used to quantify the uncertainty of each system. Therefore one or both models may be invalid.

Roger's view is that, particularly because of the uncertainty in the magnetic reference field, the internal QC applied to gyro systems is more reliable than those applied to magnetic referenced systems, and that this is true even for in-field referenced data. IFR/MSA models include several assumptions and simplifications that weaken the validity of the resulting uncertainty estimates. Roger focused on downward continuation of the surface IFR map as a particular weakness in the IFR model assumption. A Monte-Carlo simulation indicated an azimuth reference uncertainty of about twice the error model allowance. Overall Roger felt that the MWD IFR/MSA models are unrealistic and often over optimistic. He suggested this as an area of investigation for the Technical Section.

Harry Wilson pointed out that estimates of the benefit of MSC vary quite widely, and therefore MSC may be a significant contributor in cases where the MWD model is thought to be over optimistic.



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IFR-MSA.ppt

10. Collision avoidance – Grand Unified Theorem

Jerry Codling of Halliburton assessed the performance of the two most widely used types of collision avoidance rule. He said that the separation factor type rule was good for parallel well situations at shallow depth, but did not do a good job for deep or high angle well crossings; whereas risk based rules performed well in this latter situation, but were over optimistic for shallow, parallel crossings. Applying a separation factor rule to a given well separation might equate to a probability of 1:100,000 in one situation, but 700,000 at a different depth and angle of incidence.

Jerry described a “thickening factor” that, if applied to the wells’ hole/casing dimensions might correct for invalid angle of incidence effects.

Jerry pointed out that lack of validity in the error models was a problem, whichever collision avoidance rule was used. Particular problems he identified are the assumption of normal distribution and the validity of current misalignment terms at low inclination (both weighting functions and term values).

Jerry’s presentation is too large to be embedded in these minutes, but is available separately on our web site.

11. BGS Global Geomagnetic Model

Susan McMillan of the BGS described the role of the BGS geomagnetism group and provided an overview of how they build the BGS Global Geomagnetic Model.

The model is being continually evaluated and updated. Susan said that v2.2 (to be released in May) included an upgrade to allow a possible future increase in the power of the spherical harmonic model. Also, the latest model now includes large scale external field effects; in both Earth fixed and Sun synchronous co-ordinate frames. Harry Wilson asked if additional user inputs are need to a allow calculation of the Sun synchronous contribution, but Susan said that the version licensed to the Industry did not include this component, adding that it was much smaller than the other external field effects.

Bjorn Bruun asked what effect the new model would have on IFR. Susan thought that there would be very little effect on IFR.



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BGM.pdf

12. Quantifying the uncertainty when BGGM is Used to predict the downhole magnetic field

Allan McKay of BGS described the initial results of a study being carried out by him and Susan McMillan into the uncertainty associated with BGGM predictions of magnetic field parameters. The estimates included in the current ISCWSA generic MWD model come from a BGS study commissioned by Baker Hughes INTEQ in 1993, and BGS feel that changes in the model warrant a new study.

Results to date show some improvement in declination uncertainty, but not in dip. Torgeir Torkildsen asked when the results of the new study would be available for use. Allan said that there was still work to be done and, when complete, it was hoped to publish the results in a suitable Industry forum.



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13. Any Other Business

The next meeting will be held to coincide with the SPE ATCE, in Denver, in September.